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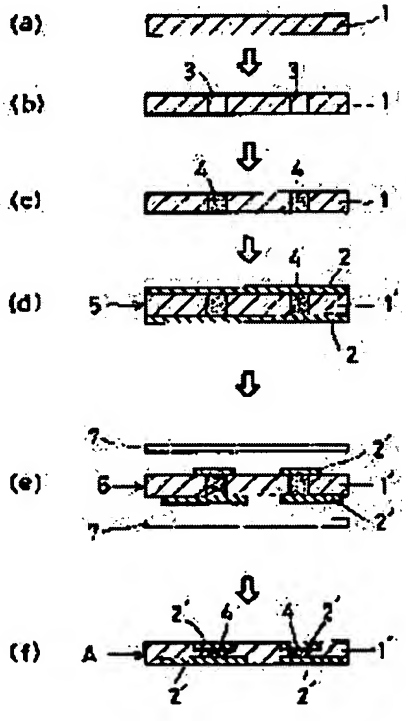
(54) SMOOTH SURFACE WIRING BOARD AND MANUFACTURE THEREOF

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a smooth surface wiring board having a satisfactory heat resistance, chemical resistance and electrical characteristics at a possibly lower heating temperature of less than 250°C.

SOLUTION: A film-like insulator 1 is composed of a thermoplastic resin composition of a temperature rising glass transition temperature of 150-230°C containing a polyaryl ketone resin having a crystal melting peak temperature of 260°C or higher, and an amorphous polyether imide resin, a conductor foil 2 is laminated on the insulator 1 and thermally bonded, so that the thermoplastic resin composition meets the relation between a crystal melting heat quantity ΔHm and the crystallizing heat quantity ΔHc shown by Equation I, conductor circuits 2' are formed, smooth flat plates 7 are laid on the obtained printed wiring



board 6 surface and hot pressure bonded, so that an insulation layer 1' satisfies the relation shown by Equation II so that both the insulating layer 1' surface and the conductor circuit 2' surface are at the same height and form a smooth surface. Eq. I: $((\Delta Hm-\Delta Hc)/\Delta Hm)\leq 0.5$, Eq. II: $I((\Delta Hm-\Delta Hc)/\Delta Hm)\geq 0.7$.

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* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] this invention -- a conductor -- it is related with the surface smooth patchboard with which the front face of a circuit and the front face of an insulating layer are arranged at the same height, and form the smooth side, and its manufacture approach.
[0002]
[Description of the Prior Art] a conductor -- the surface smooth patchboard which arranges the height of the front face of a circuit and the front face of an insulating resin layer, and formed the smooth side is known. The another name of these is carried out also to the smooth printed wired board, the flush printed board, or the flash plate circuit plate.
[0003] such a surface smooth patchboard -- a conductor -- since it is embedded so that the front face of a circuit may form the same flat surface as an insulating-layer front face, the front face of a patchboard is suitable as a patchboard for sliding surfaces with which a curved surface is formed when there is a smooth flat surface or flexiblity (flexible) nature, for example, components, such as a rotary switch, a tuner, and a commutator, contact.
[0004] After carrying out laminating adhesion (laminating press process) of the copper foil on the prepreg of a glass epoxy resin as the conventional manufacture approach of a surface smooth substrate, The approach of carrying out circuit formation, and putting between a mirror plane stainless plate further, carrying out application-of-pressure heating (smooth press process), and manufacturing, Although the method (JP,10-242621,B) of controlling the bridge formation degree of an epoxy resin by heat treatment after the circuit formation before a smooth press process, and improving mass production nature and dependability is learned the former manufacture approach -- control of a bridge formation degree -- an ununiformity -- becoming -- easy -- the conductor on the front face of a printed circuit -- a level difference tends to remain in the section and the insulating section, and smooth nature cannot manufacture enough substrates. Moreover, while the heat treatment process was newly needed by the latter manufacture approach and it was inferior to productivity, control of the bridge formation degree of an epoxy resin was the very difficult manufacture approach.
[0005] Moreover, as an approach of manufacturing a surface smooth substrate using thermoplastics, there is description which uses saturated polyester resin thermoplastic by hyperviscosity for JP,3-35588,A, JP,4-299892,A, JP,5-182805,A, and JP,7-45159,A as an insulating material. Although there is a certain process difference with the patchboard which produces these manufacture approaches The adhesion sheet of an amorphous insulating substrate as indicated by JP,3-35588,A For example, 50 degrees C, Temporary adhesion is carried out on 10kg/cm2 and the heat-and-pressure conditions for 20 minutes. This Copper foil and 70 degrees C, By forming a pattern by etching and carrying out a heat press by the pressure of 30kg/cm2 by 180 degrees C after that, after carrying out a heat roll press and laminating on the conditions for 10 minutes It is the approach of pushing in copper foil into resin, performing **-ized processing of a substrate, advancing crystallization of thermoplastic saturated polyester resin simultaneously, and raising thermal resistance etc.

[0006]
[Problem(s) to be Solved by the Invention] However, comparatively elastic thermoplastic insulating materials, such as thermoplastic saturated polyester resin, as indicated by JP,10-321992,A In case a conductor pattern is pushed in and a smooth substrate is produced, only the thickness of said adhesives or a conductor pattern deforms an insulating substrate around said conductor pattern. There is a problem that the force (residual stress) in which it returns this deformation occurs, and in being excessive, deformation which a local distortion arises and is called "flapping" to a substrate arises.
[0007] Moreover, in the case of the conventional surface smooth substrate using a glass epoxy resin, management of the bridge formation degree of the epoxy resin of a before [a smooth press process] was difficult as mentioned above, and it was not what can be satisfied in the field of dependability and mass production nature. Moreover, since the glass fabric was used and the flexible nature of a base material was missing, the application was restricted.
[0008] Although the point that it is advantageous in respect of quality control of resin as compared with a glass epoxy resin is also considered when manufacturing a surface smooth substrate as mentioned above, using the thermoplastics of polyester resin as an insulating material for substrates, residual stress occurs after a smooth press, there is a problem of distortion or a cone in a substrate, and the actual condition is that the surface smooth substrate using thermoplastics does not exist.
[0009] Then, the technical problem of this invention is offering that to which the above-mentioned trouble's is solved, residual stress's does not occur about the surface smooth substrate using heat-resistant high thermoplastics where the conductive foil after a smooth press is embedded, and a substrate's is not distorted.
[0010] Moreover, it is possible to embed conductive foil at an insulating layer and to carry out surface smoothing as other technical problems, by whenever [lowest possible stoving temperature / of less than 300 degrees C], and it is manufacturing the surface smooth patchboard which moreover has pewter thermal resistance, chemical resistance, and an electrical property.
[0011]
[Means for Solving the Problem] In order to solve the above-mentioned technical problem, it sets to this invention. In the surface smooth patchboard with which the front face of a circuit is arranged at the same height the front face of an insulating layer, and the conductor fixed to this insulating layer by embedding -- Said insulating layer 65 - 35 % of the weight of poly aryl ketone resin with a crystal fusion peak temperature of 260 degrees C or more, It consists of a thermoplastics constituent containing 35 - 65 % of the weight of amorphous polyetherimide resin. This thermoplastics constituent The glass transition temperature measured when temperature up is carried out by the differential scanning calorimetry 150-230 degrees C, Formula of the following [relation / between amount of crystal heat of fusions deltaHm, and amount of heat of crystallization deltaHc generated by crystallization in temperature up] (A) It considered as the surface smooth patchboard characterized by being what fills the relation shown.
[0012]
formula (A): [(delta Hm-delta Hc) /deltaHm] >=0.7 -- again 65 - 35 % of the weight of poly aryl ketone resin and 35 - 65 % of the weight of amorphous polyetherimide resin with a crystal fusion peak temperature of 260 degrees C or more are contained. The film-like insulator with which the glass transition temperature measured when temperature up is carried out by the differential scanning calorimetry consists of a thermoplastics constituent which is 150-230 degrees C is formed. It is the formula (I) of the following [constituent / aforementioned / thermoplastics] in piles about conductive foil to this film-like insulator. Thermal melting arrival is carried out so that the relation between amount of crystal heat of fusions deltaHm shown and amount of heat of crystallization deltaHc generated by crystallization in temperature up may be filled (laminating press). Heating application of pressure is carried out (smooth press). subsequently, the conductive foil by which thermal melting arrival was carried out -- etching -- a conductor -- a circuit being formed, and so that the relation said thermoplastics constituent is subsequently indicated to be by the following formula (II) may be filled that time -- said conductor -- the front face of a circuit -- the smooth version -- a pressure welding -- carrying out -- a conductor -- it considered as the manufacture approach of the surface smooth patchboard which consists

of leveling the front face of a circuit, and the front face of said film-like insulator in the same height.
[0013]
Formula (I) : [(delta Hm-delta Hc) /deltaHm] <=0.5 formula (II) : [(delta Hm-delta Hc) /deltaHm] >=0.7 the surface smooth patchboard of this invention constituted as described above Have the insulating layer which consists of a film-like insulator which carried out specified quantity combination of crystalline poly aryl ketone resin and the polyetherimide resin of amorphism nature, and this insulating layer with many properties which were excellent in both resin the conductor made from copper foil -- it has the thermal melting arrival nature, the outstanding chemical resistance peculiar to polyimide resin, the mechanical strength, and electric insulation for carrying out adhesion immobilization of the circuit certainly.
[0014] Moreover, the thermoplastics constituent which forms an insulating layer is said formula (A). Since it is satisfied, this insulating layer has the pewter thermal resistance which is equal to 260-degree C heating in the case of soldering.
[0015] in invention concerning the manufacture approach of a surface smooth patchboard, the conductive foil by which thermal melting arrival was carried out to one side or both sides of a film-like insulator is firmly pasted up by the thermal melting arrival nature of a thermoplastics constituent, and this conductive foil is etched -- having -- a precise conductor -- also when formed in a circuit, it pastes up firmly -- having -- **** -- a conductor -- the peel strength of a circuit is high. in addition, the surface roughening copper foil which is usually alike and is used as a raw material of conductive foil -- a conductor -- the bond strength of a circuit and an insulating layer is large, and desirable.
[0016] Relation with amount of heat of crystallization deltaHc which generates the insulating layer after carrying out thermal melting arrival of the conductive foil by crystallization in amount of crystal heat of fusions deltaHm and temperature up is said formula (I). It consists of a thermoplastics constituent which fills the relation shown, and the progress condition of crystallization of the poly aryl ketone resin which is one component of an insulating layer is adjusted to suitable extent.
[0017] next -- above -- a conductor -- the patchboard in which the circuit was formed -- receiving -- the front face -- a front face -- when applying the smooth version which consists of a plate of a smooth stainless steel plate and smooth others etc. and performing heating application of pressure, less than 250 degrees C of conditions of the low temperature near 230 degree C are usually adopted. such -- comparatively -- low-temperature heating conditions -- said formula (I) the conductor which the thermoplastics which fills the relation shown changed into the condition of exceeding a glass transition point (Tg), and was formed in the precision -- a circuit embeds in the everywhere equal depth at an insulating layer -- having -- a front face -- a smooth patchboard can be formed.
[0018] Thus, the manufactured surface smooth patchboard will be progressed by the crystallinity the thermoplastics constituent of an insulating layer is indicated to be by said formula (II), and it will have the pewter thermal resistance which bears 260 degrees C.
[0019] Moreover, since thermal melting arrival of the adhesion of a film-like insulator and conductive foil is carried out without making adhesives, such as an epoxy resin, intervene between layers, many properties which are not governed by the property of adhesives and were excellent in the insulating layer are fully harnessed, and many properties, such as thermal resistance, chemical resistance, and an electrical property, can manufacture a surface smooth patchboard efficiently.
[0020]
[Embodiment of the Invention] The operation gestalt of the surface smooth patchboard of this invention is explained with the operation gestalt of that manufacture approach based on an accompanying drawing below.
[0021] As shown in drawing 1 (f), the surface smooth patchboard A of the operation gestalt of this invention It consists of 65 - 35 % of the weight of poly aryl ketone resin and 35 - 65 % of the weight of amorphous polyetherimide resin with a crystal fusion peak temperature of 260 degrees C or more. The front face of insulating-layer 1' where the glass transition temperature measured when temperature up is carried out by the differential scanning calorimetry consists of a thermoplastics constituent which is 150-230 degrees C, the conductor which consists of conductive foil 2 (refer to drawing 1 (d)) fixed to this

insulating-layer 1' by embedding -- it is the surface smooth patchboard A with which the front face of circuit 2' is arranged at the same height, and forms the smooth side.
[0022] The process which manufactures such a surface smooth patchboard A produces the film-like insulator 1 which consists of a thermoplastics constituent which blended poly aryl ketone resin and amorphous polyetherimide resin at a predetermined rate, as first shown in drawing 1 (a).
[0023] And as shown in drawing 1 (b), the hole 3 for inner layer blind hole (IVH) formation is formed in the key point of the film-like insulator 1 with laser or a drill, after filling this up with the conductive paste 4 (drawing 1 (c)) and drying it, a vacuum heat press machine is used for both sides in piles, heating application of pressure of the copper foil 2 is carried out to them, and the double-sided copper clad laminate 5 is produced. In addition, a hole 3 may not be formed if needed and may produce the double-sided copper clad laminate 5 similarly using the film-like insulator 1 which does not have a hole 3.
[0024] Although the glass transition point of said thermoplastics constituent is exceeded at the above-mentioned heating application-of-pressure process, the crystal fusion peak temperature of polyetherimide resin is heated so that it may not exceed, namely, so that the amorphism nature of a thermoplastics constituent may be maintained, thermal melting arrival of the copper foil 2 is carried out to both sides of the film-like insulator 1, and a thermoplastics constituent is the following formula (I) at this time. The double-sided copper clad laminate 5 which fills the relation shown is produced.
[0025]
formula (I): [(delta Hm-delta Hc) /deltaHm] <=0.5 -- subsequently -- a subtractive process -- a conductor -- a circuit 2 is formed and it is made the printed wired board 6 shown in drawing 1 (e).
[0026] And while carrying out the pressure welding of the hard smooth version 7 which becomes both sides of a printed wired board 6 from a stainless steel plate etc. in a final process using the heating pressing machine usually used, it heats from both sides. It is a heating application-of-pressure press (for example, 230 degrees C) near crystallization temperature (Tc) (for example, 220-250 degrees C) so that the relation the thermoplastics constituent which forms insulating-layer 1' is indicated to be by the following formula (II) may be filled. For 50 kgf/cm2 and 10 minutes are carried out, crystallization is advanced, and the surface smooth patchboard A with pewter thermal resistance is manufactured.
[0027]
Formula (II): The heat characteristic of the thermoplastics constituent shown by the formula (I) which is an important controlling factor in invention of [(delta Hm-delta Hc) /deltaHm] >=0.7 this application, or (II) is the relation between amount of crystal heat of fusions deltaHm, and amount of heat of crystallization deltaHc generated by crystallization in temperature up.
[0028] This heat characteristic is JIS. K 7121 JIS It is computed by the above-mentioned formula (I) or (II) from the measured value of the two heat of transition which appears in the DSC curve when carrying out temperature up by the differential scanning calorimetry according to K7122, and the value of amount of crystal heat of fusions deltaHm (J/g), and amount of heat of crystallization deltaHc (J/g).
[0029] Shaping / processing conditions of a film-like insulator are large, and the value of these formulas influences, although it is dependent also on the class of raw material polymer, molecular weight, and the rate of a compounding ratio of a constituent. That is, in case a film is produced in the shape of a film, after carrying out melting of the raw material polymer, the value of said formula can be made small by cooling promptly. Moreover, these numeric values are controllable by adjusting this heat history at each process. The heat history here points out the time amount which had become the temperature and temperature of a film-like insulator, and this numeric value tends to become large, so that temperature is high.
[0030] said formula (I) since a thermoplastics constituent already have crystallinity in a high condition when the value show be over 0.5 before heating application of pressure -- subsequent smooth press (for example, for 230 - degree C, 50 kgf/cm2, and 10 minutes) application of pressure conditions -- a conductor -- it cannot become difficult to embed circuit 2' thoroughly on the front face of an insulating layer 2, and it cannot form a smooth side efficient and perfect in a short time. Moreover, if it is necessary to make heating application of pressure into the elevated temperature exceeding the crystal

melting out temperature of a thermoplastics constituent, a circuit pattern will flow, a location gap will arise and manufacture effectiveness will also fall.

[0031] And in the heat characteristic of a film-like insulator, after the heating application of pressure for surface smoothing needs to fill the relation of said formula (II).

[0032] It is because less than 0.7 low value of crystallization of an insulating layer is [the value of said formula (II)] insufficient and it cannot maintain pewter thermal resistance (usually 260 degrees C).

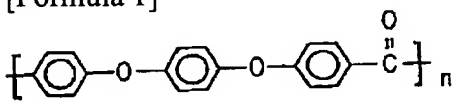
[0033] The manufacture approach of the film-like insulator 1 used in case the surface smooth patchboard A is manufactured does not need to take the manufacture approach limited especially that what is necessary is just to adopt the well-known film production approaches of having used the T die, such as the extrusion cast method and the calender method. In addition, it is desirable to adopt the extrusion cast method using a T die from the field of film production nature or stable productivity. Although the molding temperature of the extrusion cast method is suitably adjusted with the flowability and the film production property of a constituent, it is 430 degrees C or less more than the melting point of a constituent in general.

[0034] The poly aryl ketone resin which is the 1st component of the film-like insulator (or insulating layer) used for this invention is thermoplastics which includes nucleus association, ether linkage, and ketone association in that structural unit, namely, is a heat-resistant crystalline polymer which consists of combination structure of phenyl ketone and phenyl ether.

[0035] As an example of representation of poly aryl ketone resin, there are a polyether ketone, a polyether ether ketone, a polyether ketone ketone, etc., and the polyether ether ketone shown in the formula of following ** 1 can be suitably used by this invention.

[0036]

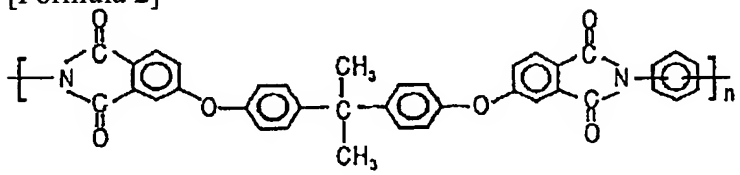
[Formula 1]



[0037] The amorphous polyetherimide resin which is the 2nd component which constitutes a film-like insulator is amorphous thermoplastics which includes nucleus association, ether linkage, and imide association in that structural unit, and can apply the polyetherimide resin shown in the formula of following ** 2 in this invention.

[0038]

[Formula 2]



[0039] And the glass transition temperature measured when the film-like insulator (or insulating layer) used for this invention consists of a thermoplastics constituent which blended two kinds of above-mentioned heat resistant resin at said predetermined rate and temperature up is carried out by the differential scanning calorimetry is 150-230 degrees C.

[0040] The reason which limits the blending ratio of coal of a thermoplastics constituent Poly aryl ketone resin exceeds 65 % of the weight. It is blended so much or the blending ratio of coal of polyetherimide resin in less than 35% of the weight of the little blending ratio of coal If it is because the crystallization rate of a constituent becomes quick and conductive foil and thermal melting arrival nature fall, and crystalline poly allyl compound ether ketone resin is less than 35 % of the weight or amorphous polyetherimide resin exceeds 65 % of the weight It is because pewter thermal resistance falls, so it will not be desirable even if the degree of crystallinity of a constituent becomes low and crystal fusion peak temperature is 260 degrees C or more.

[0041] The additive of other resin and others may be blended with extent which does not check this

effect of the invention, and a thermostabilizer, an ultraviolet ray absorbent, light stabilizer, a coloring agent, lubricant, a flame retarder, an inorganic filler, etc. are mentioned to the resin constituent which constitutes the film-like insulator used for this invention as that example. Moreover, embossing-ized **, corona treatment, etc. for handling nature amelioration etc. may be performed to the front face of a film-like insulator.

[0042] As conductive foil used for this invention, a metallic foil with a thickness of about 8-70 micrometers is mentioned, for example like copper, gold, silver, aluminum, nickel, and tin. Among these, especially the copper foil that carried out [oxidation treatment / black] chemical conversion of the front face is desirable.

[0043] As for the thickness of the film-like insulator used for this invention, it is desirable to have conductive foil twice [more than] the thickness of using for this invention. under 2 double -- the application-of-pressure conditions of a smooth press process (for example, for 230 degrees C, 50 kgf/cm2, and 10 minutes) -- a conductor -- it is because it becomes difficult to embed circuit 2' thoroughly on the front face of an insulating layer 2 and it cannot form a perfect smooth side efficiently in a short time.

[0044] In order to heighten the adhesion effectiveness, as for conductive foil, it is desirable to use what roughened beforehand the contact surface (field to pile up) side with a film-like insulator chemically or mechanically. As an example of the conductive foil by which surface roughening processing was carried out, in case electrolytic copper foil is manufactured, the roughening copper foil processed electrochemically is mentioned.

[0045]

[Working Example(s) and Comparative Example(s)] First, the manufacture approaches of the examples 1 and 2 of reference contrasted with the examples 1-3 of manufacture of a film-like insulator and this which satisfy the conditions of the film-like insulator of this invention, and these physical properties are explained below.

[0046] [Example 1 of manufacture of a film-like insulator] The dryblend of 60 % of the weight (the product made from Victrex-EEK381 G) (in the inside of the following sentences or tables 1 and 2, it is written as PEEK.) of polyether ether ketone resin and the 40 % of the weight (General Electric make: Ultem-1000) (in the inside of the following sentences or tables 1 and 2, it is written as PEI.) of the polyetherimide resin was carried out. Extrusion molding of this mixed constituent was carried out, and the film-like insulator with a thickness of 25 micrometers was manufactured.

[0047] [Example 2 of manufacture of a film-like insulator] In the example 1 of manufacture, the film-like insulator was similarly manufactured except having set the blending ratio of coal of a mixed constituent to 40 % of the weight of PEEK(s), and 60 % of the weight of PEI(s).

[0048] [Example 3 of manufacture of a film-like insulator] In the example 1 of manufacture, the film-like insulator was similarly manufactured except having set the blending ratio of coal of a mixed constituent to 30 % of the weight of PEEK(s), and 70 % of the weight of PEI(s).

[0049] [Examples 1 and 2 of reference of a film-like insulator] In the example 1 of manufacture, each film-like insulator was similarly manufactured except having set the blending ratio of coal of a mixed constituent to 100 % of the weight (example 1 of reference) of PEEK(s), and 100 % of the weight (example 2 of reference) of PEI(s).

[0050] In order to investigate the physical properties of the film-like insulator obtained in the above-mentioned example of manufacture, and the example of reference, it is following (1). And (2) The shown item was measured or calculated value was computed from measured value. These results were collectively shown in a table 1.

[0051] (1) Glass-transition-temperature (degree-C) crystallization temperature (degree-C) crystal fusion peak temperature (degree C)

JIS K7121 -- applying correspondingly -- 10mg of samples -- using it -- the PerkinElmer, Inc. make -- each above-mentioned temperature when carrying out temperature up of the heating rate by part for 10-degree-C/using :DSC-7 was searched for from thermogram.

[0052] (2) delta Hm-delta Hc/deltaHmJIS K7122 -- applying correspondingly -- 10mg of samples --

using it -- the PerkinElmer, Inc. make -- amount of crystal heat of fusions deltaHm (J/g) and amount of heat of crystallization deltaHc (J/g) were calculated from the thermogram when carrying out temperature up of the heating rate by part for 10-degree-C/using :DSC-7, and the value of the above-mentioned formula was computed.

[0053]

[A table 1]

配合とフィルムの物性＼番号		参考例 1	製造例 1	製造例 2	製造例 3	参考例 2
配合割合 (重量%)	PEEK	100	60	40	30	0
	PEI	0	40	60	70	100
(1) ガラス転移温度 (℃)		139	166	186	192	216
結晶化温度 (℃)		170	214	248	249	---
結晶融解ピーク 温度 (℃)		343	342	341	340	.....
(2) ΔHm (J/g)		48	30.4	15.7	14.4	---
ΔHc (J/g)		29	22.5	15.3	13.8	----
(ΔHm−ΔHc)/ΔHm		0.40	0.26	0.03	0.04	---

[0054] [Example 1] To both sides of a film-like insulator with a thickness of 25 micrometers obtained in the example 1 of manufacture, carried out the laminating of the electrolytic copper foil which carried out surface roughening of the front face to the electrochemistry target with a thickness of 12 micrometers, they were made to carry out thermal melting arrival on bottom of vacuum ambient atmosphere 760mmHg, the press temperature of 200 degrees C, the press pressure of 30kg/cm2, and the conditions for press time 10 minutes, and double-sided copper clad laminate was produced to them.

[0055] It describes above to the film-like insulator of the produced double-sided copper clad laminate. It carried out by the same approach which described above the measurement trial of (2) (delta Hm-delta Hc) / deltaHm, and the formula value was shown in a table 2.

[0056] Moreover, (3) later mentioned to the double-sided copper clad laminate obtained as mentioned above Bond strength was investigated by the approach and this result was written together in a table 2.

[0057] Moreover, the printed wired board which formed the circuit pattern in the double-sided copper clad laminate obtained as mentioned above with the subtractive process, and formed the conductive circuit by etching was manufactured.

[0058] And as shown in drawing 1 (e), while putting the smooth plate 7 made from stainless steel on front flesh-side both sides of the printed wired board obtained by doing in this way, the smooth press was carried out by bottom of vacuum ambient atmosphere 760mmHg on the press temperature of 220 degrees C, the press pressure of 30kg/cm2, and the heat-and-pressure conditions for press time 20 minutes, and insulating-layer 1' manufactured the surface smooth substrate which is the thermoplastics constituent which fills the relation shown by the aforementioned formula (II).

[0059] It describes above to the obtained surface smooth printed wired board. It is the bond strength of the copper foil circuit and film-like insulator in a room temperature while performing the measurement trial of (2) (delta Hm-delta Hc) / deltaHm Following (3) It investigated with the test method, pewter thermal resistance was further investigated with the following test method, and these results were shown in a table 2.

[0060] (3) Bond strength JIS The ordinary state of C6481 tore off, the copper foil of the copper foil of a FPC blank tore off based on strength, strength was measured, and kgf / 10cm showed the average.

[0061] (4) Pewter thermal resistance JIS After floating for 10 seconds based on the pewter thermal resistance of the ordinary state of C6481 in the condition that the copper foil side of a test piece contacts a 260-degree C pewter bath at a pewter bath, it took out from the bath, and cooled radiationally to the room temperature, visual observation of bulging of a test piece or the existence of a peeling part was carried out, and the quality was evaluated.

[0062]
[A table 2]

配合 ＼ 番号 / 割合と物性等		実施例 1	実施例 2	比較例 1	比較例 2
配合割合	PEEK	60	40	40	30
(重量%)	PEI	40	60	60	70
熱プレス温度 (℃)		220	240	230	240
熱プレス時間 (分)		20	30	10	20
(2) (ΔHm−ΔHc)/ΔHm		0.97	0.93	0.62	0.67
(3) 接着強度(Kgf/10cm)		1.6	1.3	0.8	0.3
(4) ハンダ耐熱性		良好	良好	不良	不良

[0063] [Example 2] Except having used the example 2 of manufacture as a film-like insulator in the example 1, having changed the heat press conditions at the time of producing 225 degrees C and a smooth substrate for the press temperature at the time of producing double-sided copper clad laminate into the temperature of 240 degrees C, and having changed press time in 30 minutes, a smooth printed wired board is produced like an example 1, and it is a trial (3). - (4) Assessment was written together in a table 2.
[0064] [Example 1 of a comparison] It is a trial (3) of as opposed to [produce a smooth printed wired board like an example 1, and] this except having changed the press temperature at the time of producing double-sided copper clad laminate into 215 degrees C in the example 1. - (4) Assessment was written together in a table 2.
[0065] [Example 2 of a comparison] Except having changed the press temperature of a smooth printed wired board into 230 degrees C, and having changed press time in the example 2, in 10 minutes, a smooth printed wired board is produced like an example 2, and it is a trial (3). - (4) Assessment was written together in a table 2.
[0066] [Example 3 of a comparison] It is trial (3) - [as opposed to / produce a smooth printed wired board like an example 1, and / this] (4) except having used the example 3 of manufacture as a film-like insulator in the example 1, having changed the press temperature at the time of producing double-sided copper clad laminate into 240 degrees C, and having changed press time in 20 minutes. Assessment was written together in a table 2.
[0067] The bond strength of the double-sided copper clad laminate of an example 1 was a good value of 0.7kgf / 10cm, and the value of (delta Hm-delta Hc) / deltaHm was also the proper value 0.31 so that clearly also from the result of a table 2. moreover, a smooth printed wired board -- a conductor -- the circuit was embedded in the uniform depth, it was the precise proper value [value / of (delta Hm-delta Hc) / deltaHm] 0.96, and the adhesion consistency was a good value of 1.5kgf / 10cm. Moreover, the result of a pewter heat resistance test was the good result of saying that bulging and no peeling are observed by the substrate.
[0068] It was a good value of 1.3kgf(s) / 10cm, and the bond strength of the double-sided copper clad laminate of an example 2 of the result of a pewter heat resistance test was also good, and its condition of a surroundings lump of the resin near the circuit pattern was also good.
[0069] On the other hand, the adhesion between layers was inadequate, bulging and peeling were observed and the smooth printed wired board of the example 1 of a comparison of pewter thermal resistance was also poor.
[0070] Moreover, although the smooth printed wired board of the example 2 of a comparison had the adhesion between layers, pewter thermal resistance was poor.
[0071] Moreover, the example 3 of a comparison is a low value of 0.2kgf / 10cm in the copper foil of

double-sided copper clad laminate, and the bond strength of a film, and the circuit exfoliated in the etching process.

[0072]

[Effect of the Invention] the insulating layer which consists of a predetermined thermoplastics constituent excellent in thermal resistance as the surface smooth patchboard of this invention was explained above -- a conductor -- heating application of pressure is carried out and it is embedded so that a circuit may form a smooth side, and while having the thermal resistance, chemical resistance, and electric insulation which bear a pewter melting temperature, where conductive foil is embedded after a smooth press, residual stress does not occur, but there is an advantage that a substrate is not distorted.

[0073] And as much as possible, the manufacture approach of the surface smooth patchboard this invention is the manufacture approach in which the less than 250-degree C thing which also whenever [low stoving temperature] embeds conductive foil at an insulating layer, and does for surface smoothing is possible, and has the advantage that the surface smooth patchboard moreover equipped with thermal resistance (pewter thermal resistance), chemical resistance, and an electrical property can be efficiently manufactured by the simple production process.

[Translation done.]

* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] In the surface smooth patchboard with which the front face of a circuit is arranged at the same height the front face of an insulating layer, and the conductor fixed to this insulating layer by embedding -- Said insulating layer 65 - 35 % of the weight of poly aryl ketone resin with a crystal fusion peak temperature of 260 degrees C or more, It consists of a thermoplastics constituent containing 35 - 65 % of the weight of amorphous polyetherimide resin. This thermoplastics constituent The surface smooth patchboard characterized by the glass transition temperature measured when temperature up is carried out by the differential scanning calorimetry being what fills the relation the relation between 150-230 degrees C, amount of crystal heat of fusions deltaHm, and amount of heat of crystallization deltaHc generated by crystallization in temperature up is indicated to be by the following formula (A).
formula (A): [(delta Hm-delta Hc) /deltaHm] >=0.7 -- [Claim 2] 65 - 35 % of the weight of poly aryl ketone resin and 35 - 65 % of the weight of amorphous polyetherimide resin with a crystal fusion peak temperature of 260 degrees C or more are contained. The film-like insulator with which the glass transition temperature measured when temperature up is carried out by the differential scanning calorimetry consists of a thermoplastics constituent which is 150-230 degrees C is formed. It is the formula (I) of the following [constituent / aforementioned / thermoplastics] in piles about conductive foil to this film-like insulator. Thermal melting arrival is carried out so that the relation between amount of crystal heat of fusions deltaHm shown and amount of heat of crystallization deltaHc generated by crystallization in temperature up may be filled. Heating application of pressure is carried out. subsequently, the conductive foil by which thermal melting arrival was carried out -- etching -- a conductor -- a circuit being formed, and so that the relation said thermoplastics constituent is subsequently indicated to be by the following formula (II) may be filled that time -- said conductor -- the front face of a circuit -- the smooth version -- a pressure welding -- carrying out -- a conductor -- the manufacture approach of the surface smooth patchboard which consists of leveling the front face of a circuit, and the front face of said film-like insulator in the same height.
formula (I): [(delta Hm-delta Hc) /deltaHm] <=0.5 formula (II): [(delta Hm-delta Hc) /deltaHm] >=0.7 -- [Claim 3] The manufacture approach of a surface smooth patchboard according to claim 2 that the conductive foil put on a film-like insulator is conductive foil by which surface roughening is carried out.

[Claim 4] The manufacture approach of a surface smooth patchboard according to claim 2 or 3 that poly aryl ketone resin is polyether ether ketone resin.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The mimetic diagram showing the production process of the surface smooth patchboard of an operation gestalt
[Description of Notations]
1 Film-like Insulator
1'insulating layer
2 Conductive Foil
2' -- a conductor -- a circuit
3 Hole
4 Conductive Paste
5 Double-sided Copper Clad Laminate
6 Printed Wired Board
7 Smooth Plate
A Surface smooth patchboard

[Translation done.]

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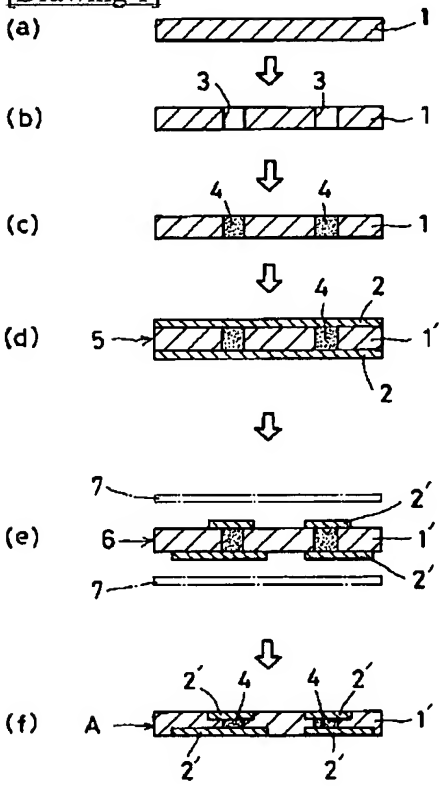
DRAWINGS

[Drawing 1]



[Translation done.]